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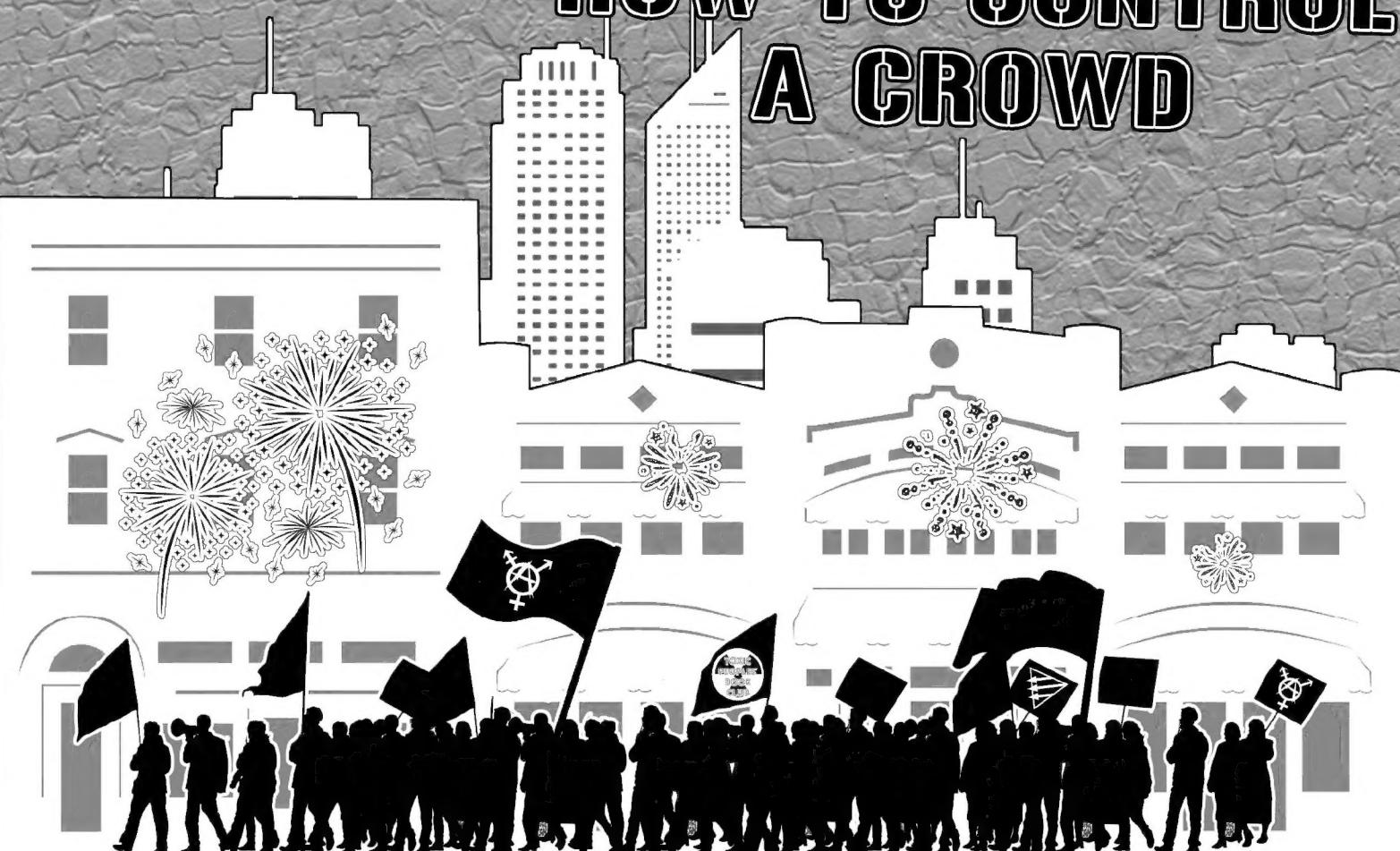
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HOW TO CONTROL A CROWD





This is the disaster scenario—it's Black Friday.

An electronics store has acquired a massive supply of scarce ninth generation game consoles and, to generate buzz, they're selling them at a massive discount—offering



After a long history of incidents, Saudi Arabia finally realized they had to get a grip on the event and invested a huge amount of money into designing a safer, more efficient Hajj system.



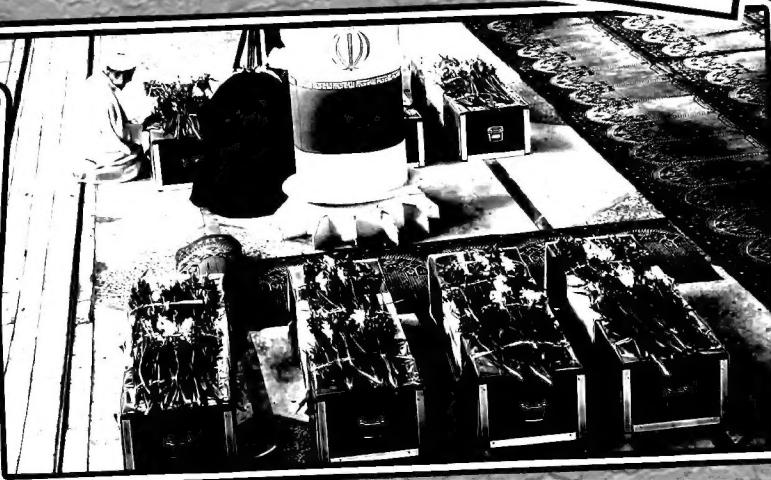
Combining infrastructure, technology, psychology, and more, the modern Hajj is perhaps the most organized event in the world and has run accident free –



since the 2015 crush.



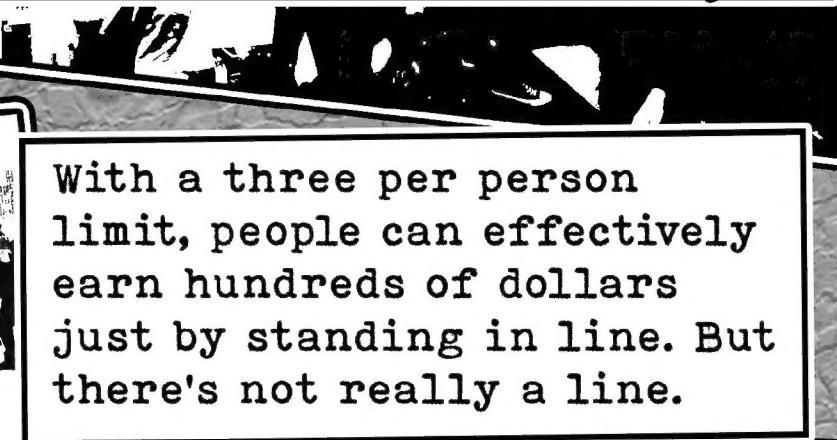
Saudi Arabia's crowd control failures at the Hajj escalated to a point where they were a legitimate geopolitical problem for the nation ...



... in the aftermath of the 2,400 fatality 2015 Mina Stampede, Saudi-Iranian relations deteriorated significantly due to the number of Iranian nationals killed.

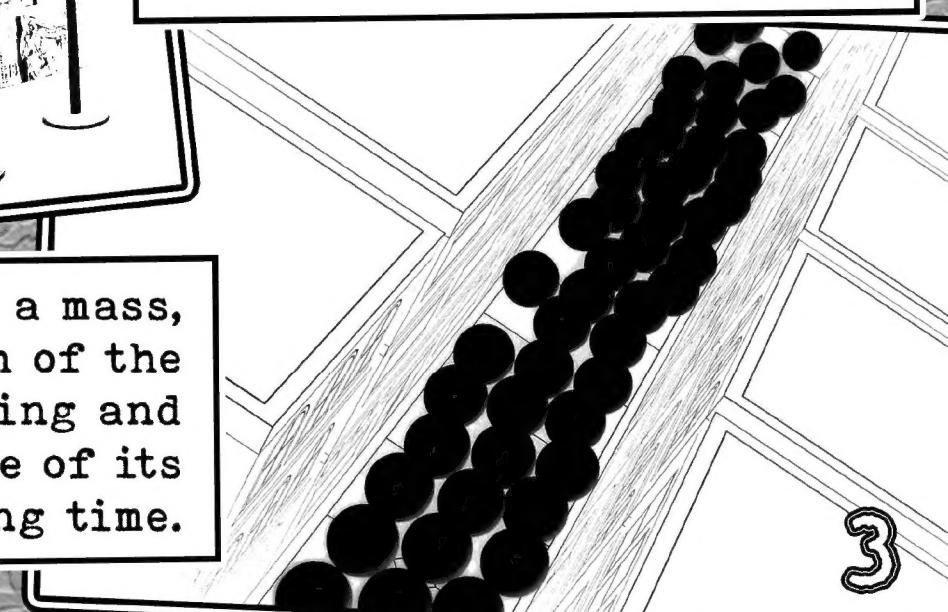
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buyers an immediate arbitrage opportunity if they sell the devices on.



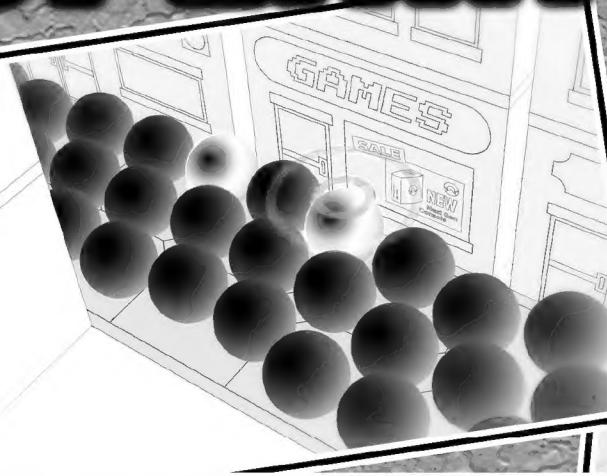
With a three per person limit, people can effectively earn hundreds of dollars just by standing in line. But there's not really a line.

Rather, it's more of a mass, filling out the width of the pedestrian mall, growing and growing in advance of its 9:00 am opening time.



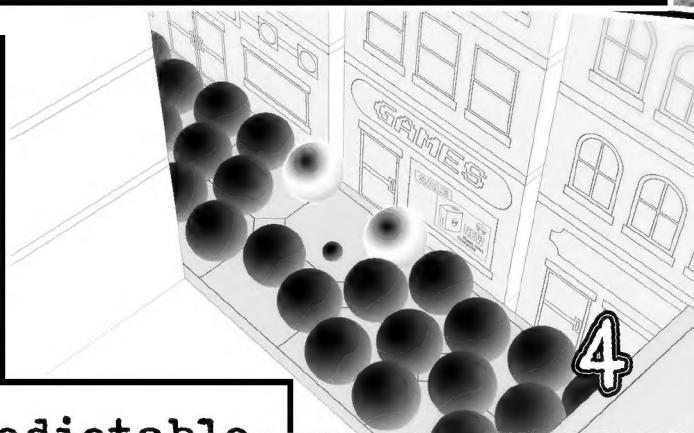
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OPENING TIME



The contracted security only arrives at 8:00 am—they're able to push through to the entrance, and get on a megaphone to say, "we need you to form an orderly line. There are only 500 consoles, we will not be able to accommodate everyone, so we need you to form an orderly line this way."

The minutes count down and, upon opening time, the security team decides to carefully let small groups in from the front of the crowd-assuring that the store and its staff does not get stormed. Fast forward thirty minutes and this will lead to a crowd crush.



This is not always predictable.

It is effectively impossible to completely eliminate all risky situations, because people love these risky situations.



What ultimately makes the difference is rather simple and rather boring – proper planning to mitigate crush potential, knowledge of the risk factors, and the ability to identify and respond when things get out of control.

Almost every incident involves the failure of one of those three steps and therefore, while the exact moments when a crush occurs might not be as predictable as it may seem, the culpability for why they occur almost inevitably is.



CONCLUSION

With the Hajj or Astroworld or the Who concert or really any incident, the cause of the crush always feels just so predictable.

They're all a perfect, varying mix of an uncooperative crowd, competitive dynamics, constrained architecture, and a bit of bad luck.

But of course, prediction is always easier in retrospect.

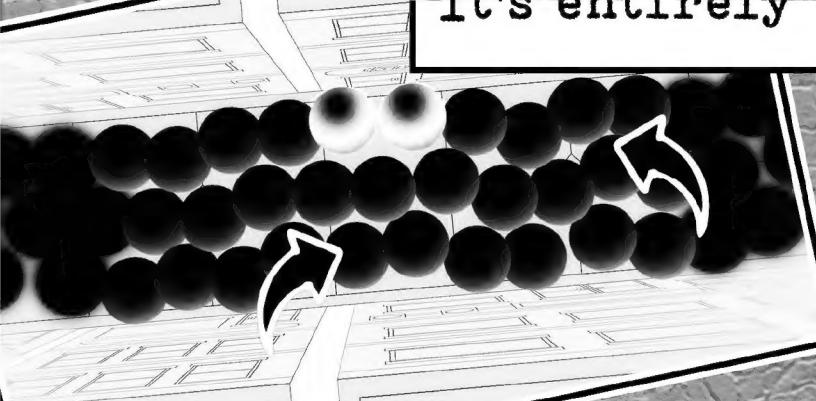


For every deadly festival crush, there are countless rowdy mosh pits having the times of their lives.



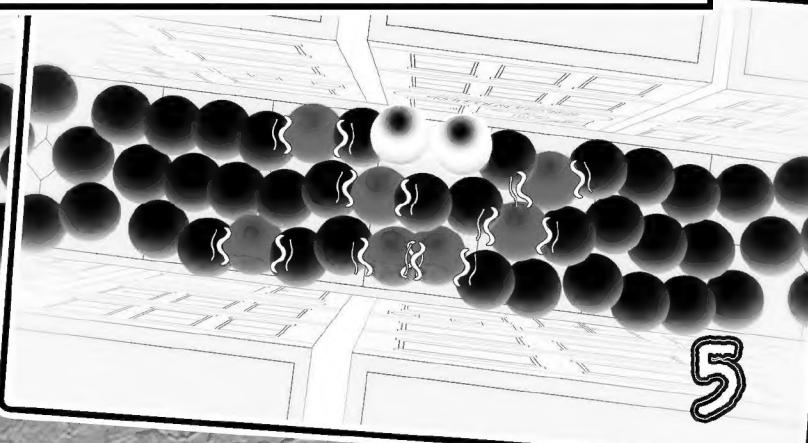
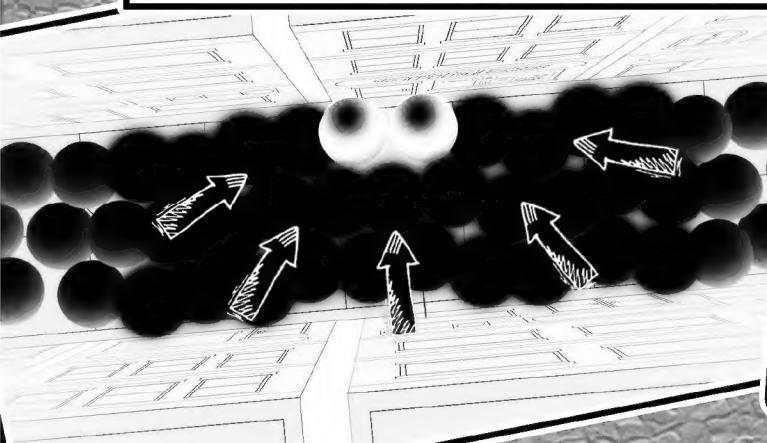
For every doorbuster sale gone wrong, there are far more whose staggering numbers bring the attention the retailer desires.

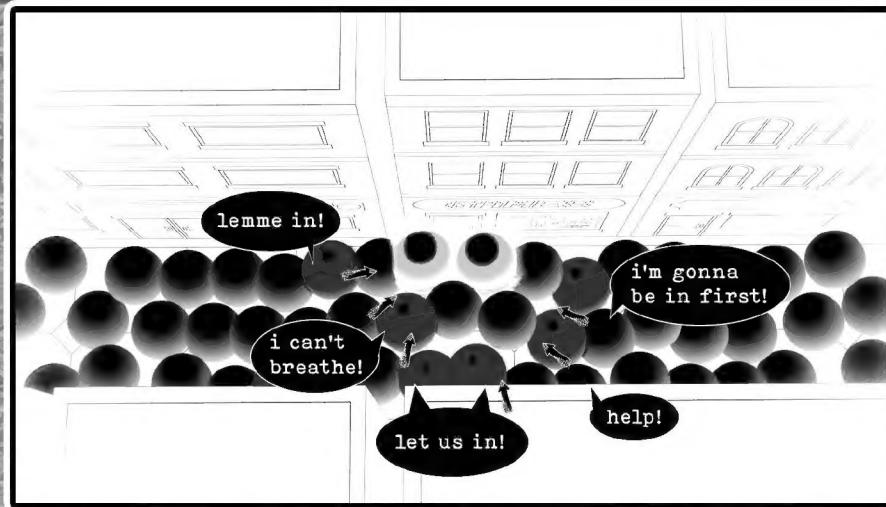
It's entirely predictable.



The back of the crowd, concerned about the fast-dwindling supply of consoles, will each individually, almost subconsciously push forward.

The core of the crowd will get compacted down, individuals will no longer have the ability to move freely, and an unlucky few will get asphyxiated - they quite literally will get crushed so hard that they're unable to adequately breathe.





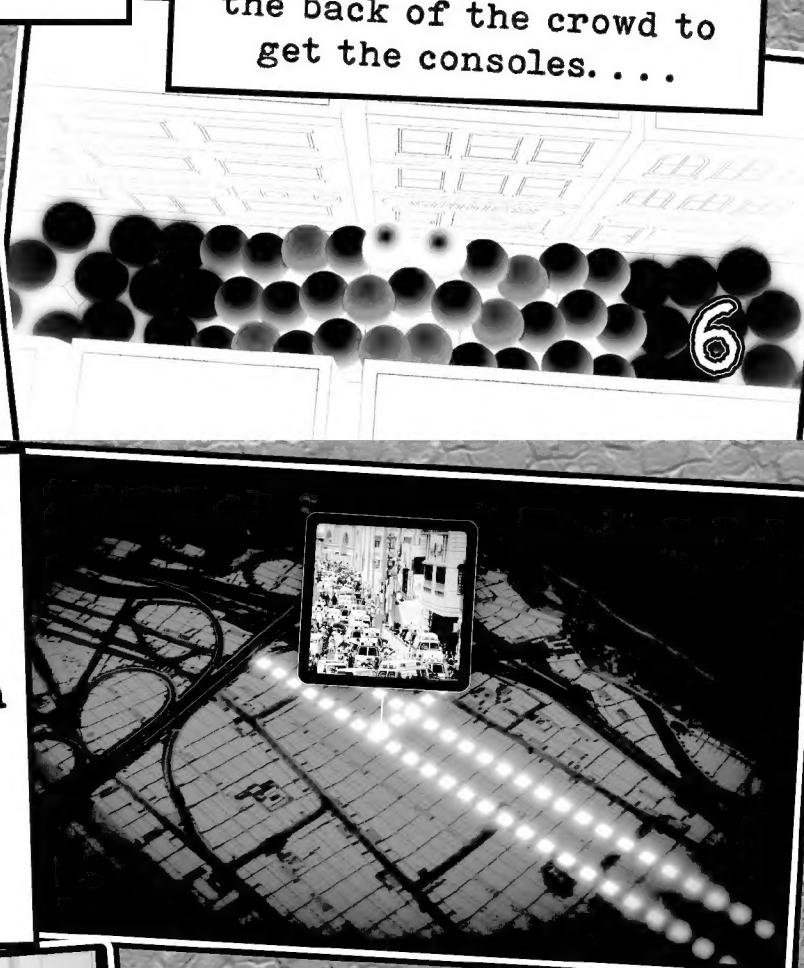
Their closest way out is into the store, leading to a further push forward, but the security, tasked with keeping the mass out of the store, will brush off the pleas for entry as an inevitable dynamic of a greedy, disorderly crowd.

That's to say, each of these three groups have different incentives—

the back of the crowd to get the consoles. . . .

the security to keep the crowd out. . . .

... Saudi Arabia in 2015 saw its worst crowd crush of the century estimated 2,400 pilgrims dying at an overlooked choke point between two commuter routes within eye shot of the nation's most impressive crowd control infrastructure.



In just hours, a problem that seemed fixed had taken a different shape, relocated at the infrastructure's nearest weak point.

For \$1 billion, the bridge was widened by 260 feet or 80 meters and atop it were now four additional floors and a massive awning to protect from the sun.

With the ability to handle more than half a million pilgrims an hour, nearly two decades on since its completion, the bridge has proved more than capable of accommodating ever growing crowds.



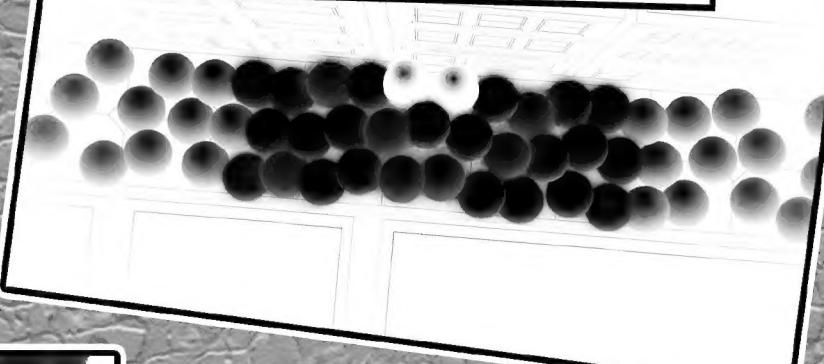
And yet, for as magnificent and expensive the complex is, it hasn't solved Saudi Arabia's crowd crush problems.



Just down the road from this complex, where pedestrian street 206 intersects with street 223 before then running into a simple T-intersection with street 204 . . .

and the core of the crowd to simply survive. . . .

but they'll all lead to the same result: an ever escalating crush.



But the absolute, overwhelming majority of crowds do not end up crushing themselves, so what is it about this rather innocuous, all-too-believable situation that makes it so theoretically dangerous?

A MINDLESS STATE

It starts with who the people are.



You see, there is an antiquated view that mass gatherings of people almost inevitably devolve into a mindless state -

that the participation in the collective dehumanizes the individual and makes them more willing to act in a disruptive, dangerous way -

but more recent research has started to dispel that notion.



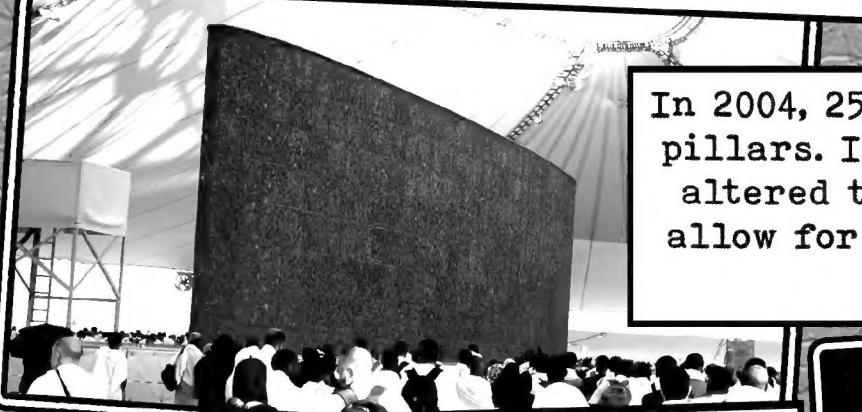
If a fire were to start in an overcrowded building, you might expect people to rush the exits, to mindlessly push those in front just to get away from the threat, but that happens remarkably rarely.

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With only three pillars to stone, though, and - as of this century - over two million muslims a year making the trek to Mecca to take part in this Hajj ritual, this has been the site of many deadly crowd crushes.



In 2004, 251 pilgrims died in a crush at the pillars. In response, the Saudi government altered the shape of the pillar's walls to allow for better crowd flow. It helped, but didn't solve the problem.



In 2006, another 345 died in a crush on the bridge's entry ramp.



Small fixes, it appeared, just weren't working, so the Saudi government decided to reconfigure the entire complex.

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CROWD CRUSHES

Of course, with the benefit of hindsight, the design flaws that turn an unruly, competitive crowd...

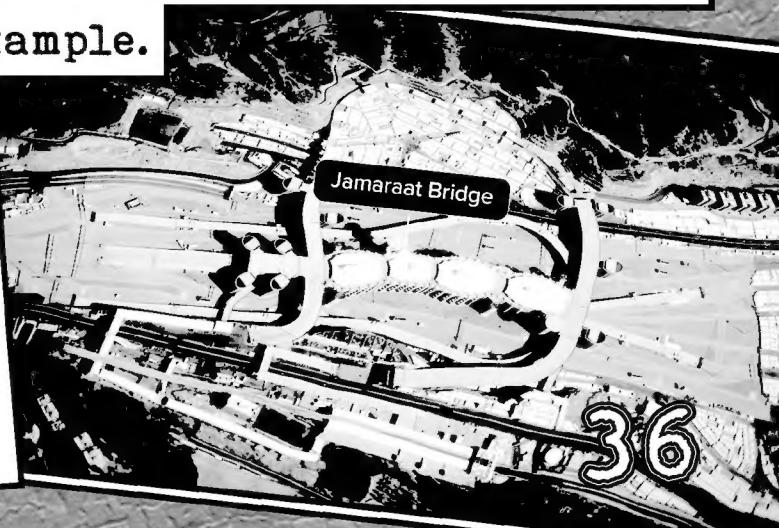
a poorly managed event...

...and a largely unregulated aspect of everyday life into horrific, deadly traps is easy to identify.

But bad design is easier to identify than to fix.

Take this bridge complex, for example.

This bridge has existed in some form since the 1960s as the sole conduit that moves muslim pilgrims by the millions who are staying in the tent city of Mina to the Jamarat pillars for the sacred practice of stoning the devil.



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Interestingly, in the exact situation where you'd expect people to disengage from the collective good, panic, and work selfishly-in emergencies-people tend to do the exact opposite.



Of the 21 major crowd-crushes to have occurred so far this decade, just two involved people running away from a deadly threat-one in Yemen spurred by an electrical explosion, and one in Egypt where worshipers fled to escape a church fire.



Running away from a fire is clearly a stronger incentive than gaining the right to buy a console, so researchers were curious as to why the frequency of crushes was so much lower in the direction with lower incentive.



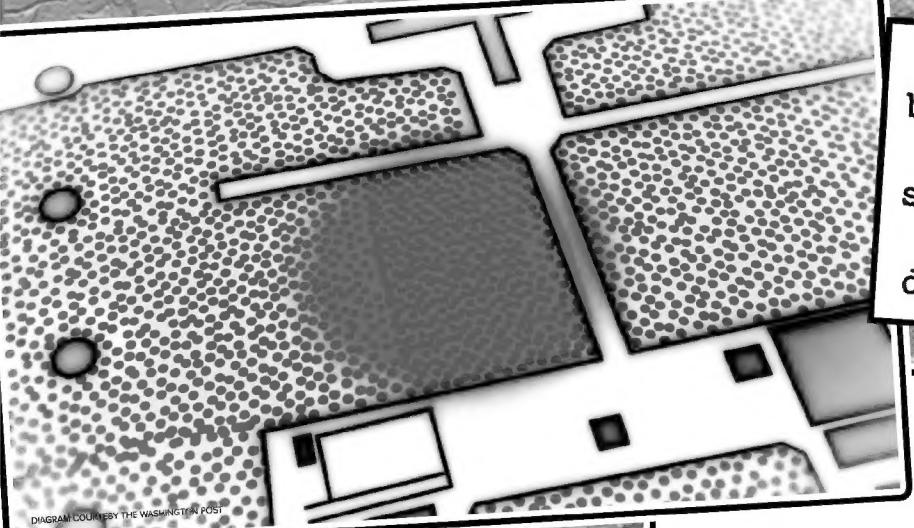
Consider a common anecdote—on a normal flight, people barely talk. They'll sit shoulder to shoulder with their fellow traveler for four or five hours without even acknowledging their presence once. But as soon as a flight gets delayed, that changes.

People start talking, they start problem-solving, they get friendly, they'll even share food.

If the flight gets canceled, this cooperation often extends further and those that were complete strangers just minutes before might decide to work together and share a rental car to drive to their destination instead.



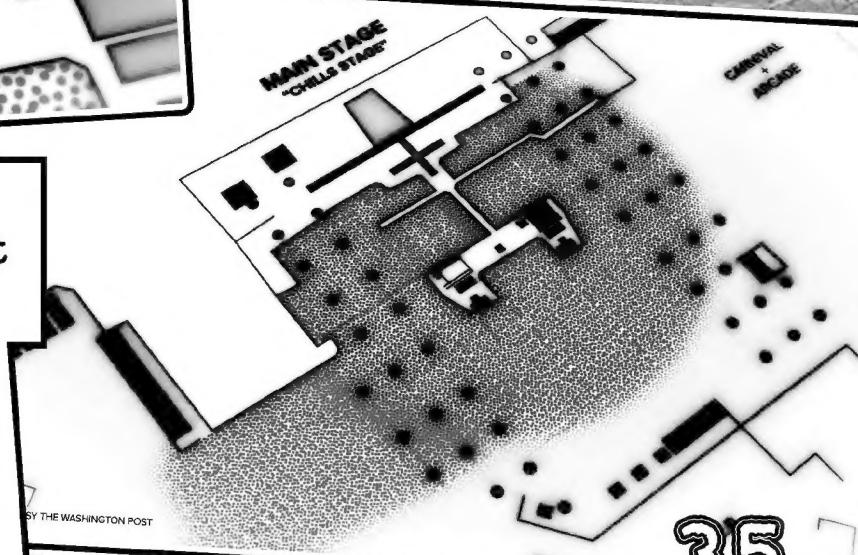
Crowd psychologists have noticed the pervasiveness of



... but instead it pushed an already dense crowd into what became effectively a corral.

Tellingly, all the deaths occurred in this quadrant of the crowd — a function of bad timing and bad barricade configuration.

Because of the location of barricades that were protecting operation tents and sound systems, though, this additional thrust of people wasn't able to dissipate through the crowd ...



But the issue here was not the size of the crowd, but the layout of the venue.

Broken into two stages, it was expected that crowds would disperse between the secondary and primary stages throughout the event – which they did.



DIAGRAM COURTESY THE WASHINGTON POST

But then the music ended on the second stage and Travis Scott delayed his start on the primary.

As the headliner, the anticipation was high and the crowd was unruly to begin with, and with the delay the crowd began to grow as festival goers shifted from the west stage to the north.



this anecdote, and they think they have an explanation.

It's all about identity.

When ambling around the airport, there is little shared identity beyond traveler which is weak since it is shared by so many. But when a flight gets delayed, the identity shifts and concentrates:



now it's "distressed traveler" – a unique identity shared only by the unlucky few.

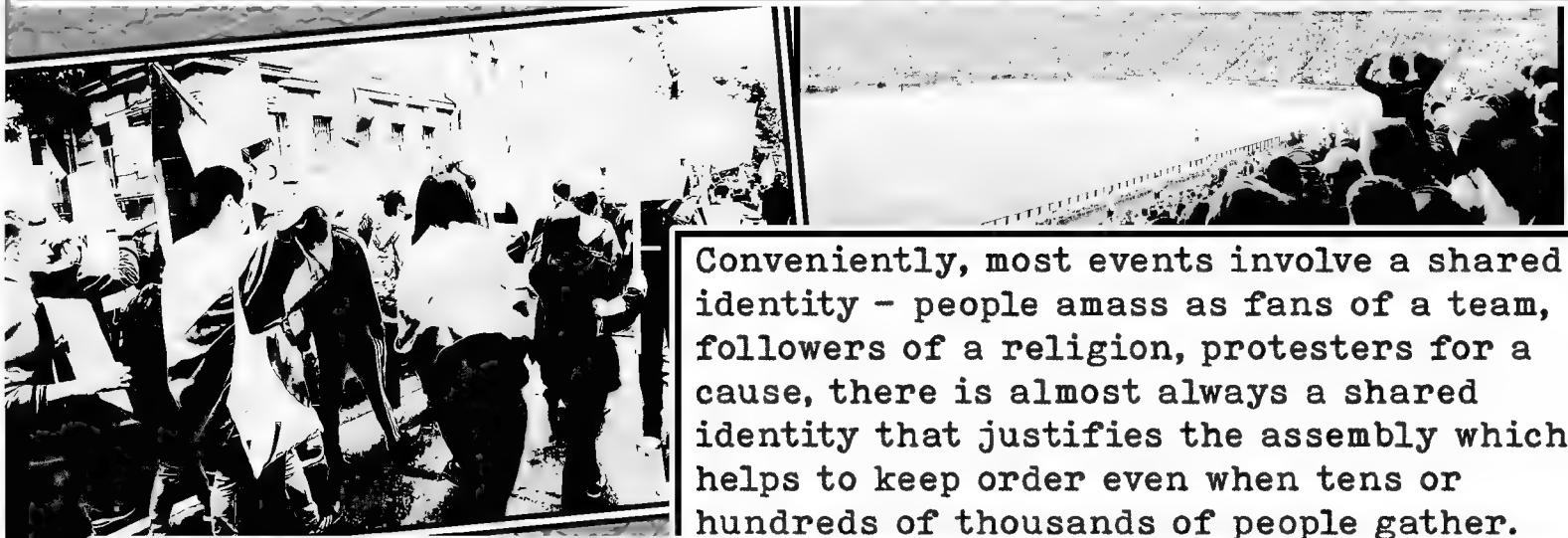


...people don't panic. In fact, they show a remarkable ability to organize themselves and support one another.

By John Drury and Stephen D. Reicher

What researchers have found is that, the greater the degree of shared identity, the greater the degree of cooperation among a crowd.

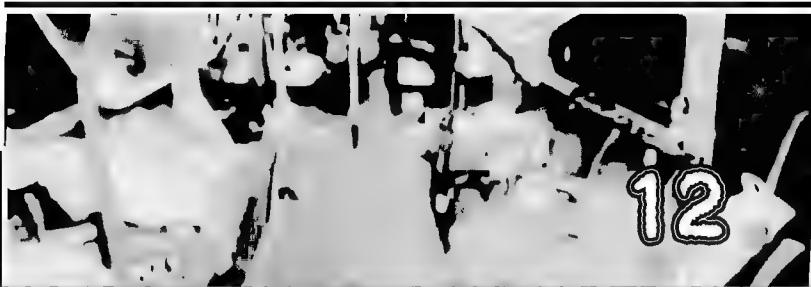
They've even been able to test this - for example, in simulated evacuation of a London underground station, study participants were more likely to help a distressed person if that person was wearing the jersey of a football team the participant was a fan of.



Conveniently, most events involve a shared identity - people amass as fans of a team, followers of a religion, protesters for a cause, there is almost always a shared identity that justifies the assembly which helps to keep order even when tens or hundreds of thousands of people gather.

And this can help to explain the infrequency of evacuation-based crushes.

On a normal day in the London underground, the mass's only shared identity is commuter.



The ill-fated festival took place at NRG Park. Home to the NFL's Houston Texans, this 350-acre complex was designed for events capable of hosting up to 200,000 people.

While the blame for the ten deaths and hundreds of injuries at the 2021 Astroworld Festival in Houston Texas has circulated between the artist Travis Scott, the promoting company Live Nation, and the Austin-based organizer, ScoreMore, in the courts of law and of public opinion - one factor that's rather irrefutable was bad venue design.



For the Astroworld Festival, though, this number was lowered by the Houston fire chief to a maximum capacity of 50,000.

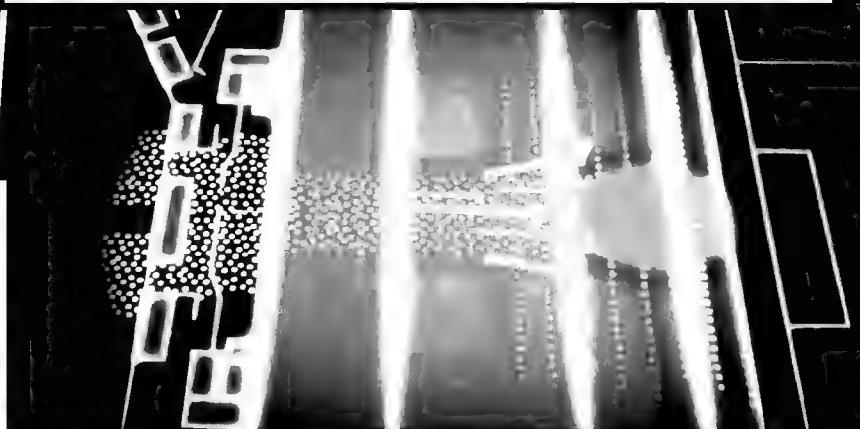
More recently, in January of 2023, north of London and east of Manchester, traveling football fans of a more ruly disposition

arrived at Sheffield Wednesday for an important playoff game only to find themselves hopelessly packed into two narrow concourses in the stadium's visitor end.



Following safety protocol, the turnstiles were even opened 30 minutes early to relieve pressure at the gates, but once inside, the delay of fans identifying and navigating to their seats, and the fact that some seats were covered, resulted in people piling in the concourses and hoisting crying kids in the air to relieve the mounting pressure.

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It's been more than close calls, too.



But then there's an explosion.



In that moment, identity immediately concentrates and strengthens: now, everyone is a victim of the same rare disaster.



In the 2005 London underground bombings, researchers interviewing victims observed a through-line of perceived unity among the victims in the moment, and countless examples of selfless, cooperative behavior even at the risk of personal peril.

This is observed in almost any disaster—there is always a high degree of crowd cooperation, far beyond what might often be portrayed in fiction, that typically leads to rather orderly, crush-free evacuations.



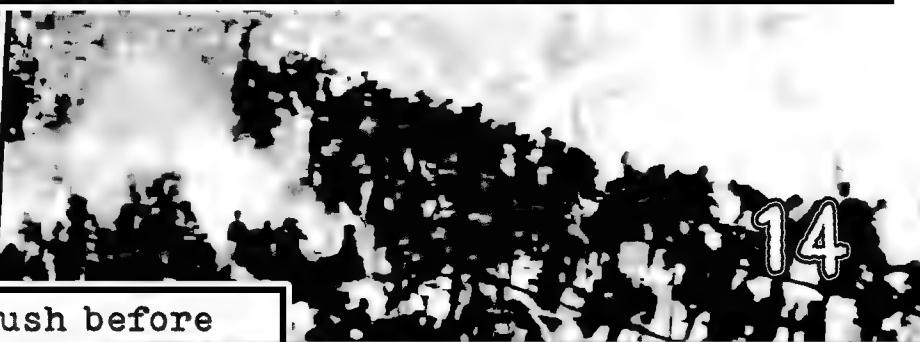
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CROWD COOPERATION



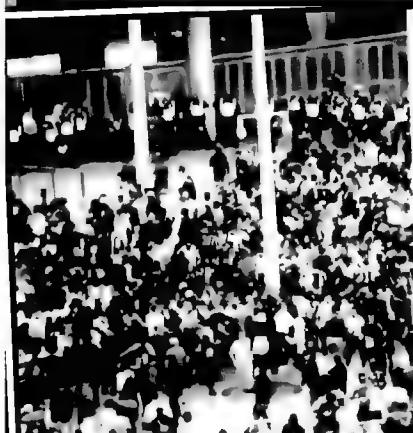
Another curious anomaly in crowd crush statistics is that it is quite rare for them to occur during civil unrest—during the very activity that defines mob mentality.

The only major crush to occur during a riot this decade was 2022's Kanjuruhan Stadium disaster, in Indonesia, but that was caused by a mass of field-invading football fans fleeing from police-fired tear gas—not by the riot itself.



The last major riot-related crush before

More importantly though, while crowds reached dangerous densities in the surge, there were no casualties.



But it was close, as findings from a following investigation reported that there were some 6,000 additional fans ready to charge the stadium had England pulled off the victory, and that the whole event hosted at one of Europe's finest sporting venues was on the razor's edge of turning to a deadly disaster.



In London at the 2020 European Football Championship final, videos of massive unmanageable crowds from outside the famed Wembley stadium began surfacing on social media.



Ticketless England fans, it turned out, had shown up en masse for the final with the idea of storming gates and overwhelming security.



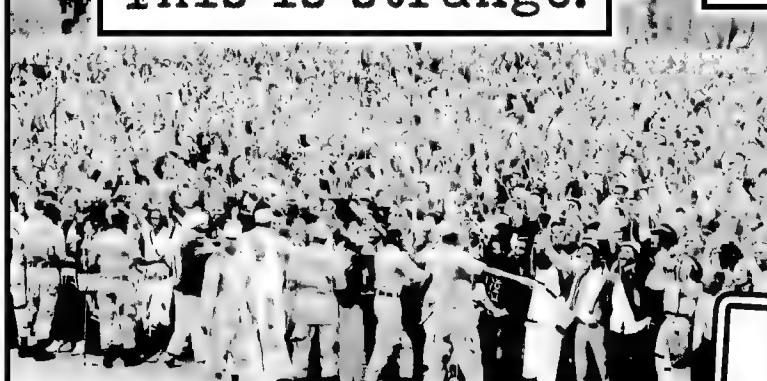
Many were successful, as 2,000 forced their way into the stadium.

that was also caused by police intervention during 2016 protests in Ethiopia.



As rare as it is to find a crush during a riot, it is yet rarer to find one where police intervention is not the cause.

This is strange.



According to traditional theories people lose their sense of self during such activities, they act savagely, feeding off the energy of the masses, and yet, somehow, the very crowd in which one would expect the highest degree of disorder is able to avoid the worst better than the football or concert or ritual-going masses.





An explanation comes from the inverse, the annual Hajj pilgrimage—one of the world's largest events where more than two million Muslims descend on Mecca to visit the spiritual center of the world's second largest religion.

This is exactly the kind of event where one would expect to see high crowd cooperativeness.

After all, compounding the strong shared identities of Muslim and pilgrim, all two or three million are expected to be in a state of Ihram, or ritualistic purity of the body and mind to the extent that they're not even allowed to break branches from trees, and yet, this pilgrimage was home to both the 20th and 21st century's most deadly crowd crush tragedies—each counting well over a thousand dead.



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BAD DESIGN

Since the Who disaster, the landscape of live concerts and events has fundamentally changed.

Today, most seats are assigned and those that aren't are heavily monitored by crowd managers and security.



Entry and exit strategies, meanwhile, are no longer assumed, intuitive processes, but heavily planned out, redundant, practiced points of emphasis in event planning.



But crowd crush on account of entrance issues and unassigned seating has yet to be solved.

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1. Factors that were out of the crowd's control,
2. and factors that stemmed from a poorly prepared venue and overmatched staff.

And it was these factors and their causes that event organizers began to consider in the disaster's wake.

While Cincinnati went the furthest with an outright ban on general admission concerts, cities across the US began adopting stricter regulation requirements for crowded events.



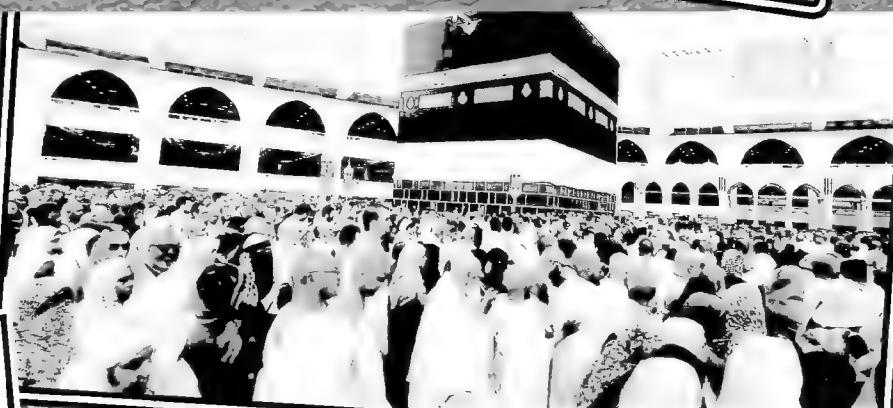
Code 2024

The National Fire Protection Association, a non-profit institution that authors model safety codes for municipal and state-level adoption, entirely rethought aspects of its Life Safety Code to better account for crowd dynamics.

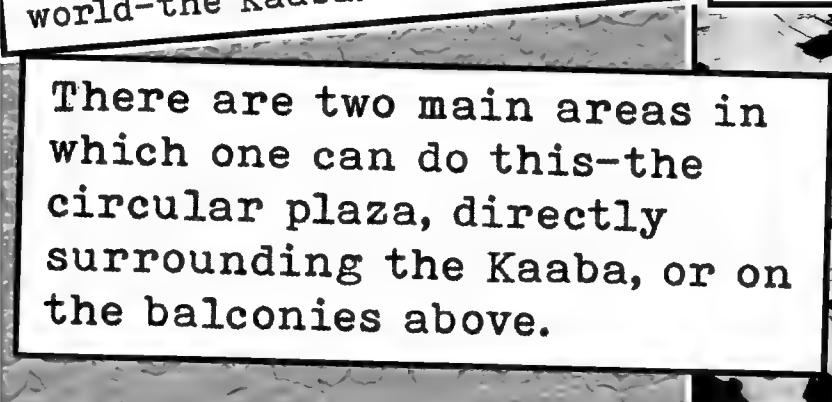
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Considering the history, researchers have long used the Hajj as a source of study of crowd psychology, and one important conclusion came from the very center of the Muslim world—the Kaaba.

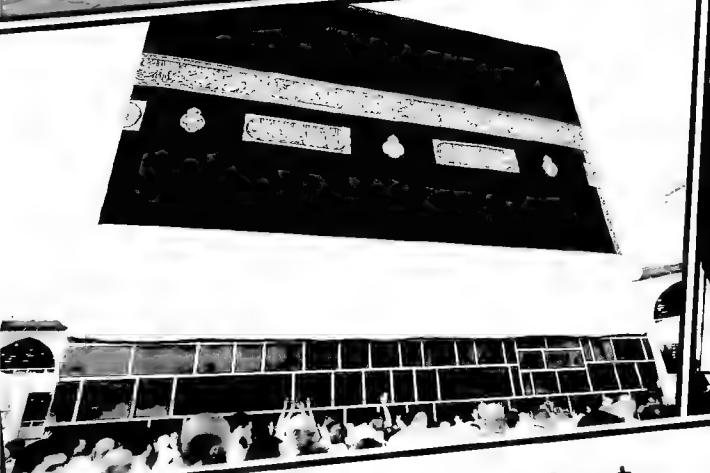


This stone structure is said to be the House of Allah, the single holiest site in Islam, so one of the most significant elements of the Hajj is prayer in the Grand Mosque of Mecca facing the Kaaba.



There are two main areas in which one can do this—the circular plaza, directly surrounding the Kaaba, or on the balconies above.

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The plaza is probably the best spot since it has an unobstructed view of the Kaaba, whereas the balconies have these pillars that obstruct the view for some.



Researchers questioned how this might impact that all-important crowd cooperativeness, and therefore surveyed more than a thousand pilgrims to find out.



What blaming a selfish, crazed crowd doesn't account for is the disconnect between overmatched and understaffed security ushering nearly 20,000 people through only two doors.



It doesn't account for people rushing those doors not to get the best spot, but to find enough room to breathe.



It doesn't account for those at the back shuffling forward not out of ill-will, but a lack of understanding as to the pressure they're exerting on the front.

At this point, the principles defining crowd movement are closer to fluid dynamics than anything else.

It was the culmination of such factors - the disconnect between security, the front of the crowd, and the back of the crowd, along with inability once caught in the crush to do anything but move with the shockwaves - that ultimately informed what's now known as the Who disaster.



In the tragedy's wake, much was made of the character of those involved - their motives, the substances they had taken, and the rock-and-roll culture that they ascribed to.

This much, in the aftermath of crowd-related tragedies, is a recurrent theme:



at concerts and festivals, its youth culture;

at sporting matches, it's hooliganism;



at religious events, it's fanaticism.



But at base, it's all bad design.

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As they expected, the balconies, the area where there is a more variable experience, an experience improved by how much one pushes and shoves to get that best spot, saw a lower degree of crowd cooperativeness.

That's to say, as competitiveness goes up, cooperativeness goes down.

In riots, though, there is little competitiveness - there's not a particular something to be gained or lost, and therefore there is little incentive to push and shove.



Not only that, but there is typically a strong shared identity-before tensions escalated, a group of people gathered together in support of a particular cause.



Therefore, riots feature two of the strongest predictors of lowered crowd crush potential, explaining how some of the least organized events manage to avoid the worst.

Meanwhile, there's a particular situation at far more organized events that time and time again has led to the worst –

Impatience grew and tensions rose across the crowd with the delay in entry.

Then at the sound of a late sound check confused as the beginning of the concert, the dam broke.

The push began from the back far outside the venue...

...but the compounding pressure was felt at the front where people poured through the two open doors with scratches, torn shirts, and without shoes...

...while others ripped at the countless other doors still closed, not to cut the line, but to release the building pressure.

At the entrance, the crowd collapsed, then it crushed, leaving 11 dead and dozens injured.

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And yet, despite all its appeal to everyone but the organizers, general admission seating in the city of Cincinnati was entirely banned from 1979 to 2004.

The 24-and-a-half year ban dates back to a Who concert on December 3, 1979.

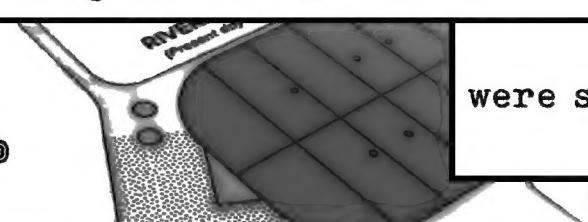


A much anticipated show, and one that easily sold out the 18,348 unassigned seats available at Cincinnati's Riverfront stadium, the concert was supposed to be a celebration, not a watershed moment in crowd control and live event policy the world over.

Of course, in any unassigned seating environment there's inherent competition—for the best view, people push their way to the front.

In this particular situation, this competition only compounded.

In order to get in the best position to push their way to the front, thousands had lined up outside the venue.



Afternoon then gave way to evening, the crowd grew cold waiting, and once the venue finally opened, those at the front were surprised to see only two meager doors swing wide to welcome nearly 20,000.

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This exact competitive dynamic led to a 2023 crowd crush in San Salvador, El Salvador; a 2022 crush in Yaoundé, Cameroon; a 2019 one in Antananarivo, Madagascar; 2017 in Lilongwe, Malawi; 2017 in Uíge, Angola—it is perhaps the most predictable crush scenario that still occurs.



a group of people have spent a good bit of money buying tickets and a good bit of time getting to a stadium to watch a concert or a sporting match or something, but with massive crowds and limited entry throughput, the event is starting and they're still outside.

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But you don't need to look for examples in developing countries for this particular situation, just look at concerts.

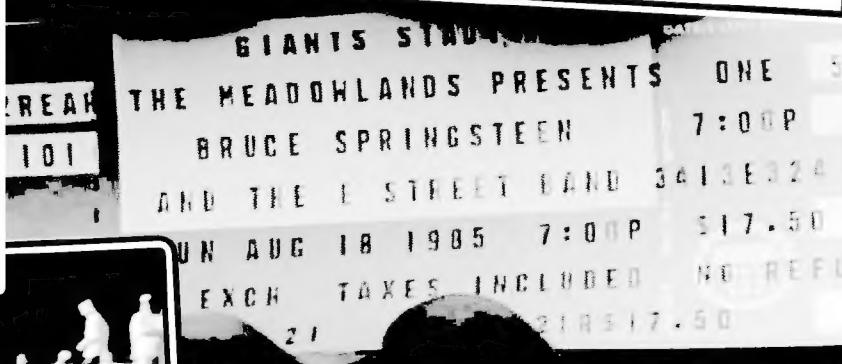
BUILDING PRESSURE

What makes a good concert, according to most, is also what makes it dangerous, and that's unassigned seating.



In a festival setting, unassigned seating is the norm, as seats of any sort are a rarity and VIP tickets - as opposed to general admission tickets - often only provide benefits in the form of easier access and a less dense crowd.

In tighter indoor and enclosed facilities, from small local venues to massive arenas and stadiums, there's often a split in ticket options—seated tickets, and floor tickets.



While seated tickets are easier on organizers and crowd experts, they're seen by concert-goers and touring bands alike as boring, overly clinical, just low-energy, lifeless experiences.



Because of this, bands and band fans insist on unassigned floor seating where energy is high and crowd interaction is more dynamic.